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# Combat Crew

strategic air command

DECEMBER 1987

★★★★

1988 THE YEAR OF THE SAC ALERT FORCE

# Know Your Limits

In several of my previous Combat Crew articles I have discussed the importance of "knowing your stuff." By "stuff" I mean the large body of knowledge that exists on how to operate our modern weapon systems. Knowing your stuff means studying this information and then applying it. I would now like to expand on this theme by discussing the importance of knowing your limits.

All our war machines have well documented, tested, physical limits for operation and maintenance. Obviously, the operators and maintainers of this equipment have their limits also. However, the big difference between people and machines is that human personal limits are not always clearly defined or tested, and certainly vary from one individual to another. This is a strength as well as a weakness.

Unlike machines, people have the ability to improve on performance—to find their limits, overcome them and expand on them. This continuing process, when conducted with conscious discipline, allows the human machine to continually redefine its capabilities—the limits of its potential. The downside of this remarkable process of defining and redefining limits is that we can operate day to day with very little conscious knowledge of our capabilities—without an awareness of the edge of our personal envelope. This lack of awareness often continues until something intervenes, an event that brings the stark, cold reality of our real limitations into sharp focus. This event can result in a valuable lesson learned—or in a tragic mishap. If you are piloting an aircraft, it could easily be the latter!

This command has recently experienced a number of accidents in which the only meaningful limit that was exceeded was a human one. Other limits were exceeded, but they were results of human failure and not the cause. The machines in these mishaps operated as they were intended—right up to the point they hit the ground. The limits that were exceeded in these mishaps, the human limits, are well documented:

**"The aircraft commander descended below. . ."**

**"The pilot failed to. . ."**

**"The crew did not recognize. . ."**

The underlying common denominator in these statements is that the people concerned did not recognize their impending approach to the limit of their personal, individual abilities to deal with rapidly deteriorating situations. As a result, they exceeded "their envelope." That is a pretty smug statement to make at ground speed zero—but we have all inadvertently been there in one way or another with less catastrophic results. For those fortunate enough to survive such experiences, they learned a valuable lesson the hard way. They gained an insight into their personal envelope and determined what they needed to do to prevent a repeat performance. Some of these valuable lessons are:

- First and most importantly, take control in the cockpit. By that I mean not just in control of your machine but also your crew, your emotions, and to the extent you are able, your environment. You won't be able to affect the outcome of a problem if you're not mentally and physically in control when flying a war machine.
- Be aware of your personal limits and those of your crew. This takes a great deal of honesty and insight. Remember that these limits change, and just like an athlete whose physical condition is constantly changing, so you and your crew experience plateaus and valleys where your performance peaks, then declines for a while before peaking again. It's your job to maintain an awareness of this phenomenon and base your decisions on these factors.
- There are good days and bad days, so you should keep something in reserve. Knowledge is the key, so study the potential outcomes. Understand the principles that are involved and consider "what if" situations during your mission planning. Hangar flying, reading magazines such as Combat Crew and studying the pounds of training material the command produces should also be sources of this reserve.
- Use caution in situations in which you are new and untested, or when your systems knowledge isn't up to speed. Nobody runs a four-minute mile the first time out, and some people will never be able to. So, if you are a middle-of-the-envelope kind of aircraft commander, don't press it. That steep night instrument approach and landing your pilot is attempting may be the limit of your ability—the edge of your envelope. Will you be capable of intervening in time?
- Finally, if it doesn't feel right, don't do it. Such a "caution light" should not be ignored when making decisions. Your subconscious awareness of your personal limits will keep you out of the weeds. Trust your instincts.

Just like the machines we fly, each of us has an operating envelope. It's unique and personal and is the sum of not only our knowledge, but also of our physical abilities and our instincts. There can be no substitute for knowing your stuff, but knowing yourself is equally important. This unique personal insight can only be achieved from discipline, motivation and a sense of responsibility to yourself and your crew members. Pilots must know their limitations—it's a rule you can live by. ★★★

**Lt Gen James E. Light, Jr.
Commander, Fifteenth Air Force**

# Combat Crew

*Magazine of the Strategic Air Command — 37th Year of Publication*

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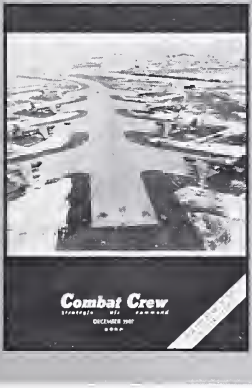

**On Our Cover:**

The alert "Christmas Tree" is a familiar sight to SAC crews, especially this time of year. 1988 marks the beginning of a year of programs dedicated to the SAC alert force.

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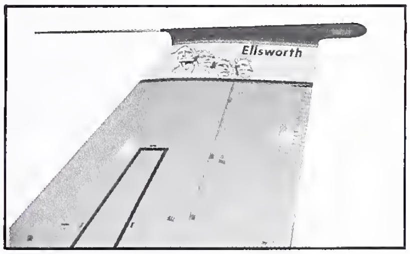

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**Next Month...**
First Alert

# Alcohol and Flying

Capt Ronald Sinclair
Ehrling Bergquist Hospital
Offutt AFB

It's getting late and you've got a flight early tomorrow. But here you are standing in the bar shooting the breeze with the crew. SAC rules state a minimum of twelve hours between the bottle and the throttle. Since you still have twelve and a half hours before the flight, is there time for one more?

Should you observe the letter or the spirit of the regulation? The letter of the reg says twelve hours; the spirit means flying unaffected by the alcohol you've consumed. The effects of alcohol vary with different people. All of these things need to be considered before we drink or refuse that last glass. Most of us think we know what the alcohol will do to us. Research shows the results don't always match our expectations. A quick review might help explain what is happening and improve our expectations.

To begin with, alcohol is a mild poison to your body. Your body has certain enzymes which were probably developed to destroy the alcohol which is naturally fermented in small quantities in your gut. Man has learned to artificially ferment his own alcohol and therein lies the problem. When alcohol is broken down by your liver, it forms acetaldehyde and acetic acid. It does this by reducing certain metabolic components your body uses. Both acetaldehyde and acetic acid are harmful. Not only do you poison yourself with these by-products, you interfere with a valuable hormone your brain makes called ADH.

ADH is the mechanism by which your body decides how much water it should retain and how much it should pass through your kidneys. Drinking a lot of alcohol artificially tells your body that it has too much water and some should go. Next time you go drinking, check the frequency of rest room usage if you don't believe me. If you drink, use the rest room frequently, and then go home to sleep, your body has removed too much water and dehydrated itself. That's where the hangover comes into play. The next morning you wake up for the mission bleary eyed, musty mouthed, and generally feeling less than tip top shape. More than likely you'll have a headache (although it may be mild) and generally experience trouble getting moving. The shower helps, but not enough; coffee helps some, but the thought of food is repulsive. Or maybe you feel good. Either way, by the time S-1 rolls around maybe you'll feel fine.

Actually the effects of alcohol are cumulative. Remember sleeping like a log last night? You dropped into a deep sleep so that only the alarm clock at its loudest could wake you. What you have done is destroyed your REM sleep. That's the sleep where you dream and can be recognized by the rapid eye movements that accompany it. You need that REM sleep to get the best rest. Deprived of REM sleep, test subjects get progressively more cranky. They also produce more errors in judgment and execution.

A 1985 study done on pilots in the simulator offers dramatic proof. **It appeared in the December '86 issue of the American Journal of Psychiatry.** The purpose of the study was to determine whether pilot performance is impaired 14 hours after a pilot has drunk enough alcohol to be considered legally drunk. The subjects were Navy P-3 pilots. All pilots were under the age of 32 and in excellent health, with an average flying experience of 1115 hours. All pilots drank alcohol socially; by self-report their use ranged from two drinks per week to more than two drinks per day.

Pilots flew a carefully designed flight simulation involving an engine failure on takeoff and subsequent engine out approach and return to the field. Each flew one of two scenarios under the control (no hangover) condition and the other scenario under the hangover conditions. The pilots flew several instrument approaches in the simulator. During the approaches and resulting missed approaches, the reaction times and deviations from course and glideslope were recorded to establish a baseline. The next week the pilots were allowed to consume alcohol until their BAT exceeded .10%. Fourteen hours (including a good night's sleep) elapsed before the pilots returned to the simulator to fly the same profiles.

The results showed a definite drop in performance in both recognition and correction. Pilot performance was worse in the hangover condition on virtually all measures. There was a 9 degree larger heading control deviation in the hangover condition as well as a 12 knot deviation from the TAS during the takeoff portion. During the approaches the average deviation from the localizer course was 1100 feet greater than in the hangover condition! The glideslope deviation was 86 feet greater.

The results of this study may be understood in part by alcohol's effect in reducing the ability to process information. There is evidence from other studies that alcohol impairs many aspects of memory. If alcohol reduces working memory capacity, ability to divide one's attention between two or more mental tasks is likely to be altered. Pilot performance is highly dependent on these components of human cognition. Pilots must maintain a variety of information in working memory during most phases of flight. In particular, during landings and takeoffs pilots must be cognizant of air speed, altitude, rate of descent or climb, heading, and so on. Thus pilots in such conditions may experience an overload of processing demands when their processing capacity has been reduced by drinking.

Alcohol also reduces the ability to perform non-routine acts and has even greater effects when subjects are required to respond with an incompatible act. In terms of pilot performance, this suggests that in emergency conditions the effects of alcohol may be most pronounced. So, even though they were in compliance with the regs, and felt no ill effects, these pilots were not in tip top shape.

**Use this chart** as a guide to tell you how much you can drink. The chart supposes that you've eaten, and are drinking an "average" drink. BALs for people with empty stomachs, and for those drinking more potent drinks (martinis, manhattans, "doubles," and the like) will be higher.

## BAL CHART

| | **1 Drink** | | | | **2 Drinks** | | | | **3 Drinks** | | | | **4 Drinks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **After hours** | **4** | **3** | **2** | **1** | **4** | **3** | **2** | **1** | **4** | **3** | **2** | **1** | **4** | **3** | **2** | **1** |
| **Weight pounds** | | | | | | | | | | | | | | | | |
| 80 | — | — | — | .02 | — | — | .05 | .08 | .07 | .10 | .10 | .10 | .12 | .12 | .15 | .15 |
| 100 | — | — | — | .02 | — | — | .04 | .06 | .05 | .07 | .08 | .09 | .09 | .10 | .12 | .13 |
| 120 | — | — | — | .02 | — | — | .03 | .04 | .03 | .04 | .06 | .08 | .06 | .08 | .09 | .11 |
| 140 | — | — | — | .01 | — | — | .02 | .04 | .02 | .03 | .05 | .06 | .04 | .06 | .08 | .09 |
| 160 | — | — | — | .01 | — | — | .02 | .03 | .01 | .02 | .04 | .05 | .03 | .04 | .06 | .08 |
| 180 | — | — | — | .01 | — | — | .01 | .03 | — | .02 | .03 | .04 | .02 | .04 | .05 | .07 |
| 200 | — | — | — | — | — | — | .01 | .02 | — | .01 | .03 | .04 | .01 | .03 | .04 | .06 |

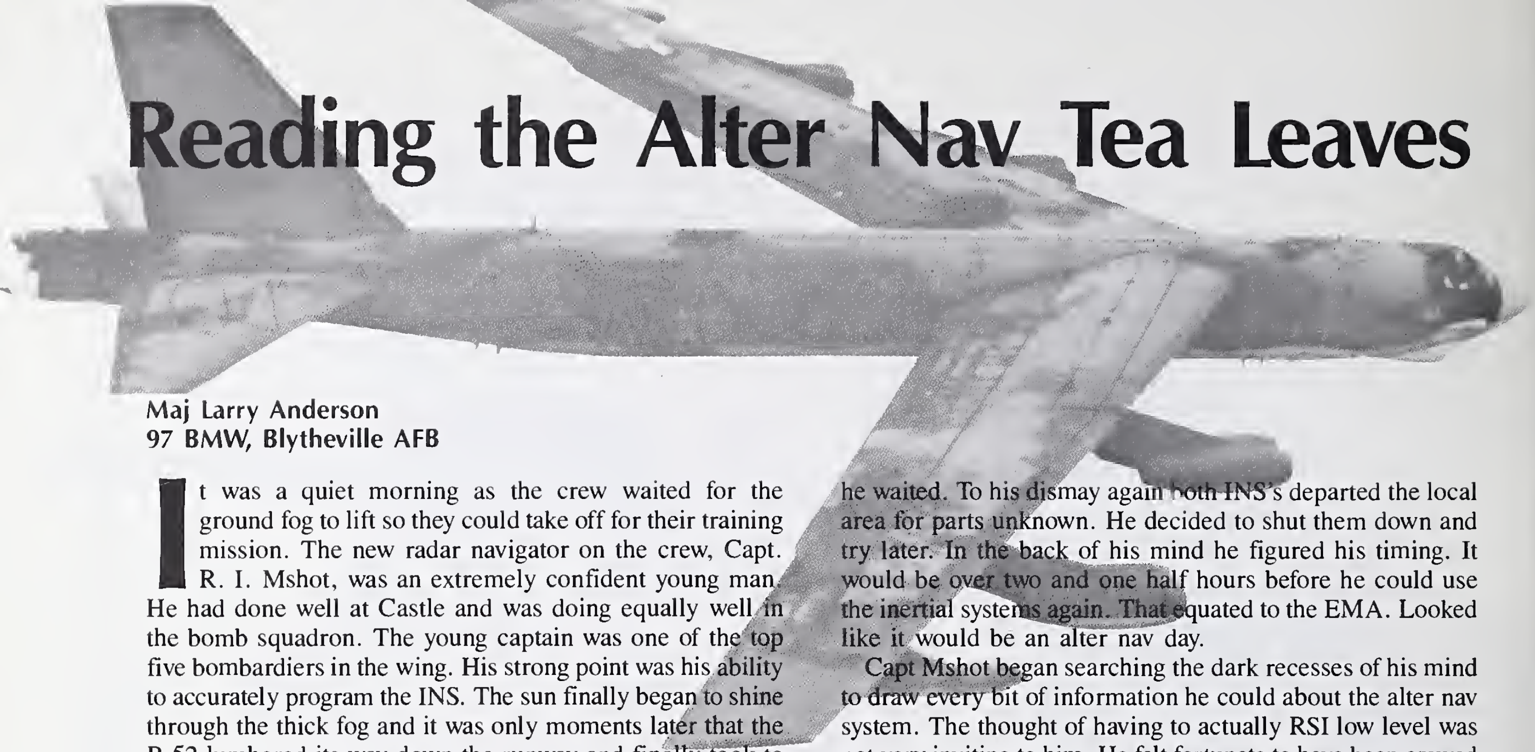
| | **5 Drinks** | | | | **6 Drinks** | | | | **7 Drinks** | | | | **8 Drinks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **After hours** | **4** | **3** | **2** | **1** | **4** | **3** | **2** | **1** | **4** | **3** | **2** | **1** | **4** | **3** | **2** | **1** |
| **Weight pounds** | | | | | | | | | | | | | | | | |
| 80 | .17 | .17 | .19 | .20 | .19 | .22 | .22 | .25 | .25 | .27 | .27 | .30 | .29 | .30 | .32 | .33 |
| 100 | .13 | .14 | .16 | .17 | .16 | .18 | .19 | .21 | .20 | .22 | .23 | .25 | .24 | .25 | .27 | .28 |
| 120 | .09 | .11 | .13 | .14 | .13 | .14 | .16 | .17 | .15 | .17 | .19 | .20 | .19 | .20 | .22 | .23 |
| 140 | .07 | .09 | .10 | .12 | .10 | .12 | .13 | .15 | .13 | .14 | .16 | .17 | .15 | .17 | .18 | .20 |
| 160 | .06 | .07 | .09 | .10 | .08 | .09 | .11 | .13 | .10 | .12 | .13 | .15 | .13 | .14 | .16 | .17 |
| 180 | .04 | .06 | .07 | .09 | .06 | .08 | .09 | .11 | .09 | .10 | .12 | .13 | .11 | .12 | .14 | .15 |
| 200 | .03 | .04 | .06 | .08 | .05 | .07 | .08 | .09 | .07 | .09 | .10 | .12 | .09 | .10 | .12 | .13 |

**Numbers equal** the percentage of alcohol in the blood. Dash (—) = a trace of alcohol.

Is there a way to minimize the effects of alcohol so that it won't interfere with flying? The answer is yes.

Plan how much alcohol you can safely absorb. Consult the charts which tell you how much you can drink before you are legally drunk. Then plan how long it will take to completely sober up. Plan on losing about 0.01% each hour. Give yourself a buffer. If you're 200 lbs, you can probably have about 6-7 drinks in the first hour before you're legally intoxicated. Then about 1-2 drinks an hour to keep you going. Before you go to sleep drink a lot of water (without the bourbon). Give yourself at least 12-15 hours before flying to allow the alcohol to be metabolized by your body.

Remember, partying hard up until the last bell can be fun, but the cumulative effects of alcohol will catch you when you need your wits the most. Drink safe, Fly smart!



# Reading the Alter Nav Tea Leaves

**Maj Larry Anderson**
**97 BMW, Blytheville AFB**

It was a quiet morning as the crew waited for the ground fog to lift so they could take off for their training mission. The new radar navigator on the crew, Capt. R. I. Mshot, was an extremely confident young man. He had done well at Castle and was doing equally well in the bomb squadron. The young captain was one of the top five bombardiers in the wing. His strong point was his ability to accurately program the INS. The sun finally began to shine through the thick fog and it was only moments later that the B-52 lumbered its way down the runway and finally took to the air to begin its mission for the day.

All during the departure the radar navigator had difficulty positioning the crosshairs. They did not seem to want to track a return. When the INS finally timed out he gave a sigh of relief because he knew he had it made with the inertial system up and running. As he approached the departure fix he prepared to input his initial inertial nav programming update using a familiar aiming point — a bridge. Again he had a problem keeping the crosshairs on the return. He quickly positioned the crosshairs on the bridge and pressed the Qual 1 button. As the system was processing the fix he noticed the wind on the system status line was in excess of 250 knots. As he expected, when the system finally finished processing his fix the INS initiated a spindown. Not just INS 1 but INS 2 decided to follow its twin into never-never land. The young radar was unshaken — there was plenty of time to recover. He began his timing for the cooling period for IMEs. Alter was selected as prime and to his surprise the wind was still over 200 knots. Capt Mshot quickly checked Format 6 and noted the hard doppler fault indication. A quick bit check of the doppler confirmed his worst fears — the doppler was gone for the day. What would he do now? He had never had a successful doppler out INS alignment and he had pencil whipped all his doppler out and alter nav training requirements. It was beginning to look like one of those days. He vowed to give it his very best.

When both the INS's came out of alignment again the radar was just finishing his fifth memory point wind run and was not very confident of its accuracy. A 100-knot wind at altitude in the middle of the summer over Missouri was not what he had expected and was 80 knots different from the wind sheet. During the next twenty minutes he searched diligently for a high quality fix to put into the system and finally located a bridge he wanted to use. With great care and precision he positioned the crosshairs, depressed the Qual 1 button and waited for the results. After receiving a reject message on all three systems, he decided to override the reject. Again he waited. To his dismay again both INS's departed the local area for parts unknown. He decided to shut them down and try later. In the back of his mind he figured his timing. It would be over two and one half hours before he could use the inertial systems again. That equated to the EMA. Looked like it would be an alter nav day.

Capt Mshot began searching the dark recesses of his mind to draw every bit of information he could about the alter nav system. The thought of having to actually RSI low level was not very inviting to him. He felt fortunate to have been crewed with an old B-52D radar nav just before he went to CCTS. Though they had differing opinions of the system, as system operators they respected each other's ability. Maj I. R. Crusty thought the OAS operators were not made of the same "stuff" as the real radar men he had known. They never attempted to table fly their missions — not even to a new route. They were too dependent on the OAS for RSI. He had a deep respect for their general system knowledge but felt something had been lost in the art of radar navigation. He had forgotten that the old B-47 radar navs felt the B-52 radar navigators were wimps because they had something called a doppler and dual integrated offset panels. The young Lt Mshot respected the older radar man's vast knowledge of nav procedures and his coolness under pressure. Maj Crusty didn't always know which button to press but he could always calmly pull himself out of the quagmire. He loved to operate with alter prime. He often said, "I never know what the INS is thinking, but I can always read the alter nav tea leaves." The last four words in that statement kept repeating in the young radar's head and he attempted to remember what it all meant. He had often asked the old major to explain.

Maj Crusty said he liked alter because he controlled all the inputs to the systems navigational computations. If something was wrong it was wrong because he put in bad information and he could correct the input. He always stressed the fact that the alter system was nothing more than a DR computer that used drift, groundspeed, position and heading information to resolve the navigation problem. If he put in an accurate altitude, took a good fix and input an accurate memory point wind and heading, the system had to DR accurately. The problem most people experienced was in determining which of these inputs needed updating and when. The majority of the operators only updated present position and rarely updated the winds. But what did he mean about those tea leaves?

Suddenly he remembered! Maj Crusty had explained that the radar crosshairs were like tea leaves of the alter system

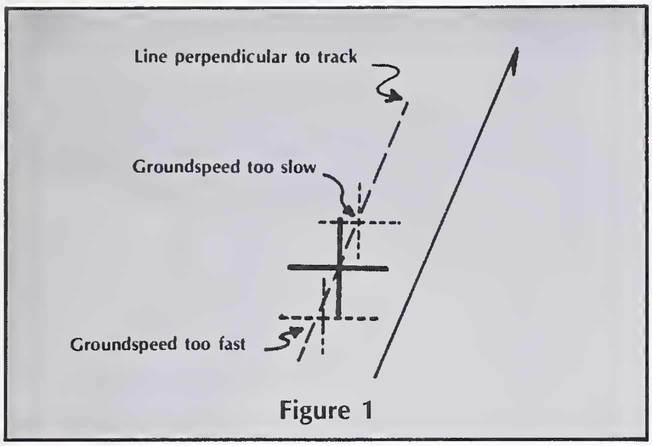


Figure 1

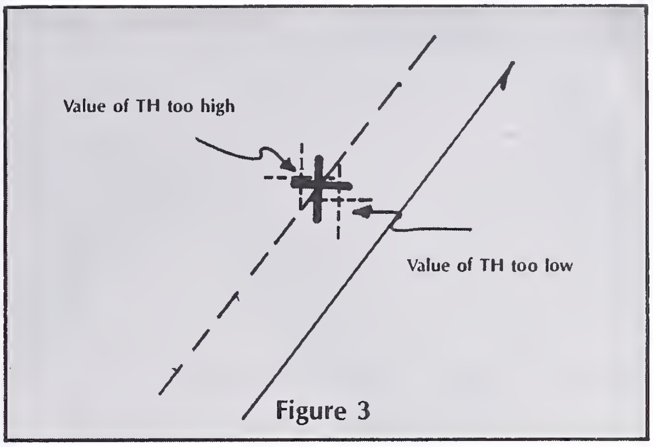


Figure 3

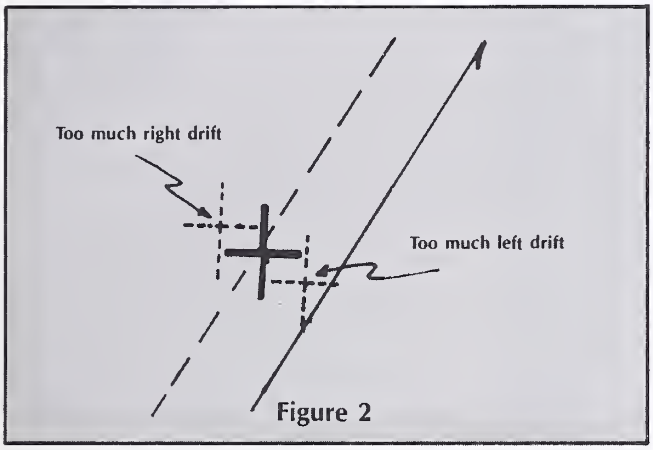


Figure 2

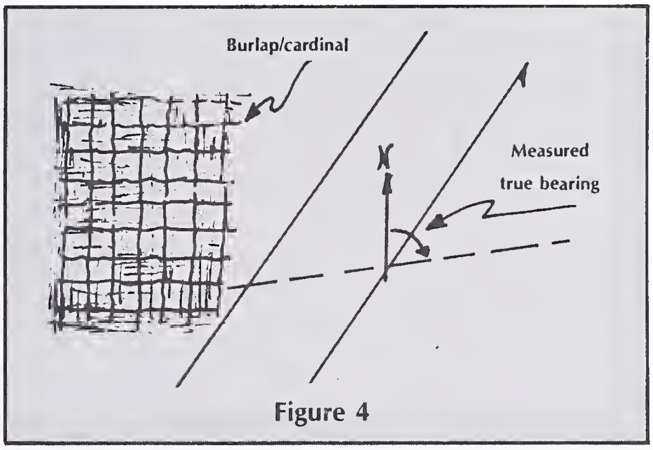


Figure 4

and by looking at them closely one could tell what the system needed. The OAS uses system information on track and groundspeed to position the crosshairs on a return and cause them to remain there by updating their position so as to cause them to track toward the aircraft at groundspeed rate along a line parallel to the aircraft ground track. Therefore, if the crosshairs do not track the return, an evaluation of the tracking error will tell you what inputs to the system are in error.

The problem of position does not enter into the discussion here because the system would be updated whether the operator chooses the inertial reference or alter. The first consideration is the wind input. Observing crosshair movement will tell you if you need to do another memory point wind run. A wind error will cause the crosshairs to track long, short, right or left of the return. If the groundspeed is too slow the crosshairs will always track off the return in a direction away from the aircraft but parallel to ground track. If the groundspeed is too fast, the situation is reversed and the crosshairs track parallel to ground track closer to the aircraft **(Fig. 1)**. If the groundspeed is good and the drift has the highest degree of error the crosshairs will fall off the return right or left of the return perpendicular to a line parallel to the aircraft ground track **(Fig. 2)**.

The final problem radar navs face is that of determining the aircraft true heading. Heading error is detected by noticing angular tracking of the crosshairs off the return **(Fig. 3)**. Additionally, the operator can check the alignment of radar burlap or cardinal effects to determine the accuracy of the system heading. The heading can be corrected by performing an alter heading calibration. One easy and quick way of checking heading is to perform a terrestrial heading check. For this check the operator measures the true bearing between two returns that will be visible on the radar when the aircraft passes between them. When the aircraft crosses this bearing line on track, the measured bearing should be the same as that observed on the radar azimuth scale — the error is equal to the system heading error **(Fig. 4)**.

Capt Mshot was preparing himself for low level entry. Sweat was rolling down his forehead, he had developed a pulsing twitch in the upper right corner of his temple and his hand was trembling as he made a final delicate correction to the trackball prior to taking the last fix before low level. He went over what the older radar man had explained to him one last time and finally convinced himself that he could do it. He was patient and careful all through the low level. The day was made when he rolled inbound to the target and noted his initial buffer values were only 750′. He thought to himself, "This ain't so bad. I knew I could do it." The IMEs timed out just as he hit the high exit point for the low level and worked fine all the way home but he would never forget the lesson of the day — **never forget how to read the "alter nav tea leaves."**

We need to remember the basics when we have to fly with the alter nav system as prime. When you schedule yourself for an alter nav system low level navigation and bombing exercise make sure that is exactly what you do. Don't let the time you "have" to use alter be the first.

# Refueling Basics . . . Aero Effects

**Maj Alan J. Doi**
**CFIC, Castle AFB**

Aero is a hot topic these days and refueling includes numerous "interrelated aerodynamic effects." We have all heard the saying that learning to refuel is 90 percent mental and only 10 percent skill. Not much has been written about teaching this phase of flight and most techniques have been passed down from "generation to generation."

For the instructor, however, this phase of flight is one of the most challenging and rewarding to instruct simply because you can't teach someone how to refuel on the ground—you have to get the student up there in the air and do it! It requires an abundance of prebriefing; and then a lot of inflight demonstration, instruction, error analysis, and more instruction. Learning to refuel is like learning to land—it's both a science and an art. The "art" can only be instructed in the air but the "science we can talk about on the ground. Smooth aircraft control during this phase of flight is a game of anticipation. A good understanding of some of the interrelated aero effects will assist us in anticipating changes behind the tanker.

## ELEVATION EFFECTS

For the beginning student of air refueling the tanker autopilot is normally left engaged so we will not cover pitch changes caused by interaction between the tanker and receiver. Instead, this discussion of elevation effects will center on the interrelation between changes in elevation versus fore/aft movement. The first area of our discussion will center on our old friends, the receiver director lights.

Most of us are taught right from the start that the fore/aft director lights do not indicate true fore and aft movement, but rather they show us changes in boom extension. To illustrate this concept to their students many instructors pull out the trusty old load adjuster and use the sliding piece to simulate the extendable part of the boom. This helps the student visualize how pure vertical movement also causes changes in the extension of the boom, thus giving false indication of fore or aft motion. If we move up in the envelope the boom will be compressed with the director lights giving an indication of forward motion; and moving down will extend the boom with the lights giving an indication of aft motion. Failure to understand this concept usually results in "chasing" fore/aft movement with power changes when they may actually be caused by lack of stability in the vertical plane. Once this occurs the student will tend to have a difficult time re-establishing a "neutral" power setting since fore/aft motion is the most difficult for the new student to recognize. This is why we normally teach students to stabilize their vertical position before making any big power changes to correct their fore/aft position.

Eventually, we do learn to stabilize our vertical position, but since none of us are perfect, at times we will find ourselves off the 30 degree line. In the case of an instructor demonstrating the upper and lower limits, we purposely move ourselves from the centered position. Now we need to understand how vertical movement affects the tanker in another way. The boom is a "protuberance" for the tanker and therefore affects parasite drag. Relative to the 30 degree elevation of the boom, moving up will streamline the boom and decrease the tanker's drag while moving down has the opposite effect and will add drag. We can see this graphically in **figure 1**. This figure shows the changes in thrust required for the tanker to hold an airspeed as the boom moves in elevation. To hold a speed of about 255 KCAS, moving from 30 degrees to the upper limit of 20 degrees results in about a 4.5 percent decrease in total thrust required for the tanker; and moving to the lower limit of 40 degrees increases the total thrust required by about 5.5 percent. Fine, but what does this mean in practical terms to us bomber pilots?

We can see that vertical movement while in contact will cause drag changes to the tanker. However, because of momentum and inertia the effects of these drag changes will occur gradually. The tanker pilot will not see any noticeable change in airspeed and will not move the throttles. The end result for us receivers will be the same as if the tanker had made a slight power change—i.e., fore/aft motion. This means that we will have to re-establish a new "neutral" throttle position if we change and hold a new vertical position.

Let's use an example to better illustrate why it is important to understand both the interaction of the director lights and these drag changes. Let's take the case of a student that is relatively stable but is about 3-4 degrees low. Since he is stable he has a pretty good neutral throttle position. Now he makes an aggressive correction back up to 30 degrees elevation, the centered position. Initially, the boom will compress and the fore/aft lights will "show" forward motion. The student reacts to this by reducing thrust. However, he has also decreased the tanker's drag and this will cause the tanker to accelerate slightly. Now the student has two things causing aft motion: his thrust reduction and the tanker's acceleration. He will be moving aft faster than he expected but will still attempt to stop at 12 feet extension, in the "green," by reapplying the thrust. Now, however, because the tanker has accelerated slightly due to the reduced drag (i.e., same as a power increase) the "neutral" throttle position the student had is no longer enough to hold position. He will now get into a see-saw battle with the throttles in an attempt to re-find that elusive neutral throttle position.

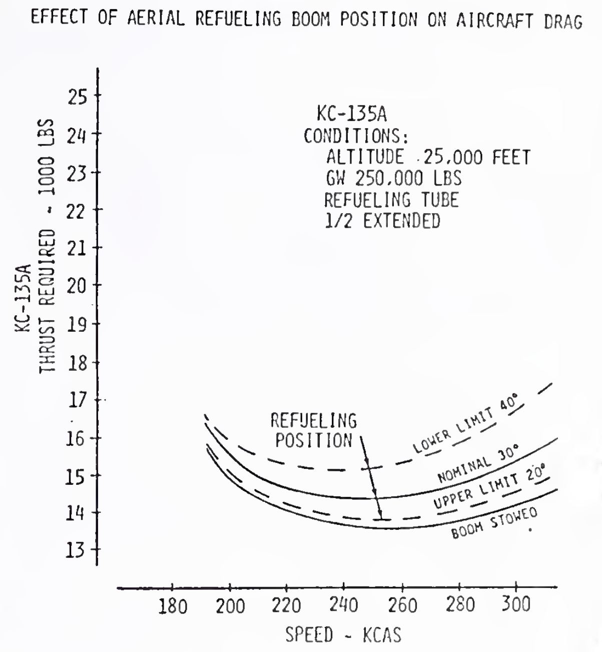


**Figure 1.**

Understanding these concepts and then reinforcing them in the air will help the student refine and anticipate thrust changes. Something else to note from figure 1, the boom drag effects are more pronounced at higher speed and also the lower elevations have a bigger effect than the upper. Also, for instructors that purposely fly off-center while demonstrating the elevation limits, this will help you anticipate the thrust changes that will occur.

## LATERAL EFFECTS

Let's continue our discussion with a look at controlling lateral position. How about a show of hands—any bomber pilots out there who have never executed the dreaded "pendulum" maneuver while in the contact position? Yep, we all know what I'm talking about—the old side-to-side PIO (pilot induced oscillation) that we get ourselves into while learning how to refuel. Usually we get about two "swings" and on the third one either the system disconnects or, more likely, the boom operator punches us off. This maneuver we receivers do all by ourselves, unlike the "bomber-tanker rock" that we get into when the tanker autopilot is off. In that one, both pilots are in a PIO with each other. We will save our discussion of the "rock" for another article.

Let's analyze some of the factors associated with lateral control problems for the novice receiver. First of all, a commonly heard critique concerning lateral problems goes something like this: "You aren't seeing the movement soon enough and you are letting the momentum develop." How true, but then if the student were seeing the "movement" he would probably make some correction! For most of us, a change in actual lateral position is relatively easy to see. The student's reaction, if he's brave enough to challenge his instructor, would probably go something like: "Well, I am seeing the movement just as soon as it starts!" The real problem here is one of semantics and perceptions. The student is talking about and looking for actual lateral movement from centerline. The instructor, on the other hand, is talking about "movement" relative to the tanker's wings. In other words, if the receiver's wings don't match the tanker's wings in bank angle, then the receiver will eventually move from the centerline. Notice I said eventually—this does not occur instantly because of our friends inertia and momentum. The instructor is seeing the bank angle difference well before the student. The student may not even be looking for this type of "movement." The technique of using the tanker as a big ADI is one method used to convey this idea. So, instructors, be sure the student is not only hearing but understanding what you are talking about—what is obvious to you may have completely eluded the student and your job is to get that light bulb to come on!

Ok, we have dealt with the perception problem, let's talk about lateral control during refueling. But first a moment on the basics of lateral control in the bomber. Note **figure 2**—here we are cruising alone in level flight. We will assume a perfectly rigged and trimmed aircraft. Both wings are producing an equal amount of lift so there is no rolling motion. Now, how do we get the bomber to roll, let's say to the right? We turn the yoke to the right (**figure 3**). This puts some right spoiler up and "spoils" some of the lift on the right wing. Now the lift is no longer equal. We have more lift on the left side than the right, hence we roll to the right. Very basic, we have been doing the same thing since pilot training—if we want to turn right, we move the yoke/stick to the right! Now, let's get our bomber into air refueling behind the tanker.

Here we are in refueling formation with the tanker (**figure 4**). In order to isolate the latter effects, we will assume a perfect tanker, bomber, and pilot. Make a quick comparison of **figure 4** to **figure 2**—neutral yoke, equal side-to-side lift, and no roll. Sounds about the same but there is a definite difference. The tanker is up there producing lift. As an aircraft produces lift it affects the airflow around it. Relatively speaking, the airflow produces an upwash ahead of the aircraft and significant downwash behind it. Plus, there is the vortex created at each wing tip. Therefore, unlike the bomber in **figure 2**, the bomber in **figure 4** is being affected by all this "disturbed" flow from the tanker. The result is a varying pressure pattern across our wings. Not to worry, since we are exactly on centerline with our "perfect" aircraft, both the left and right wings are being affected equally and the pressures (lift) left-to-right are in balance.

Now let's move off centerline and see what happens (**figure 5**). We will move our aircraft instantly well right of centerline. Because our wingspan exceeds that of the tanker, a good part of the right will be out there in the "clear air" (although in reality, it is probably still affected by the tanker's flow pattern but to a much lesser degree). However, the left wing is now almost completely affected by the tanker. The result: we are getting more lift from the right wing than the left wing at any given body angle. The lift from side-to-side is now **not** equal and if we make no control input we will roll to the left (towards centerline), just as we did when we spoiled some lift on one wing (**figure 3**). Basically, we can think of the aircraft "seeking" that position that will equalize the lift on both wings—i.e., centerline (normally). Now obviously the lateral position in **figure 5** is exaggerated—we normally would not find ourselves off centerline this distance. But the same effects occur, to a lesser degree, when we move around laterally in the contact position—the plane rolls towards centerline. Next question: how do we make our aircraft "want" to fly off centerline (e.g., a lateral limits demo)?

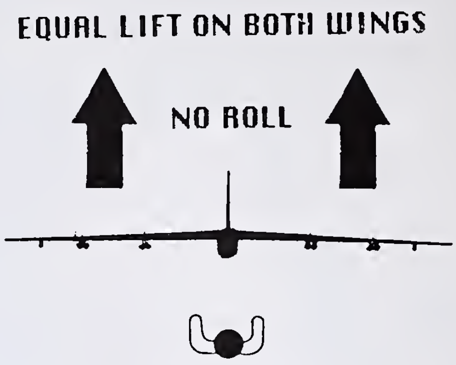


Figure 2. Neutral Yoke

Well, since the "problem" is the unequal lift from left to right, what can we pilots do to re-equalize the lift? Right—we can "spoil" some of the extra lift on the right wing with a right yoke input. Since we are the "perfect" pilot we put exactly enough yoke (spoiler) to equalize the side-to-side lift (**figure 6**) which results in no roll motion. Now, if we hold this yoke input, the aircraft will "want" to remain in this new position and if it drifts off it will roll back towards this position. Well, in reality, the world is not perfect! Even when we are on centerline we continuously make small yoke inputs to keep leveling our wings with the tanker's. These small corrections are made around a neutral yoke position of approximately horizontal (yoke centered). If we wish to intentionally fly off centerline, we still have to make these small corrections but we must remember to create a new neutral yoke position that is offset from yoke centered (we need to continuously equalize the lift). Have you ever watched a new receiver that's a little nervous and ends up with a death-grip on the yoke? He will many times inadvertently "cock" the yoke off the centered position. When he does this the aircraft will not want to fly on centerline. He will be stable but usually from two to four degrees off centerline. He has inadvertently created a new neutral/equalized position for the aircraft (just like we attempt to do during a lateral limit demo). But old habits are hard to break and if you watch someone learning to intentionally fly a lateral limit you will notice that their hand keeps returning the yoke to the centered position. This results in a roll back towards centerline.

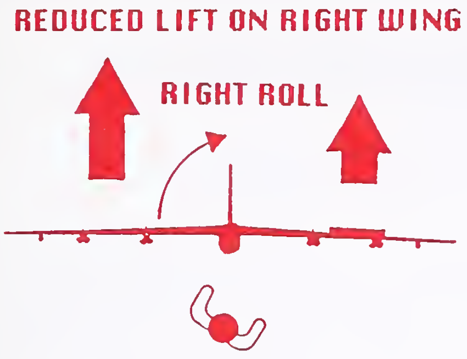


Figure 3. Right Yoke Input

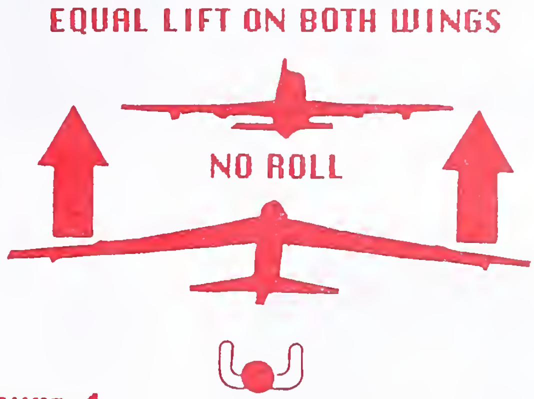


Figure 4.
Centerline - Neutral Yoke

Now that we understand these lateral effects, let's get back to our student with the "pendulum" problem. Can you explain what is happening to him? Yep, first of all, he does not recognize (or sees it late) the fact that his wings are not level with the tanker's—result: lateral movement developing (let's say to the right). Next, for as long as he has been flying, if you want to turn back to the left you move the yoke to the left! In this case, he might need some initial left input to re-level his wings with the tanker's but once that is done, he actually needs some right input to keep from rolling back to the left too quickly. Right yoke input to move left? Yep, won't be easy convincing his hands to do that! Anyway, he will tend to hold his left input while at the same time the unequal lift is also helping him roll back towards centerline—result: a rapid roll back towards and usually through centerline. And the cycle starts again!

You might notice that I haven't mentioned the use of the rudder and/or cocked throttles (asymmetric thrust) as a lateral control. Both of these work through yaw—changing the relative sweep of one side of the wing versus the other side. We have all studied this phenomenon in our asymmetric thrust classes (roll due to yaw). Basically, we increase the lift on the forward swept side and decrease lift on the back swept side. Looking at **figure 5** we can see that using yaw would be another way to "re-equalize" the lift. Before you go out there and stomp on the rudder pedals, remember we are dealing with airspeeds much higher than in the traffic pattern (where we use the rudder the most). At these higher speeds, it takes very little yaw to cause these lift changes in the contact position. For the new student, using the rudder before he has learned to stabilize his spoiler (yoke) inputs will probably hurt more than help.

This, in a nutshell, has been a few of the basics of refueling. Developing our understanding of the interrelated forces between the two aircraft and how they affect us in the refueling envelope will help us anticipate changes and control inputs. The result will be smaller, more timely corrections and overall smoother refuelings. Keep in mind that this phase of flight includes a good amount of individual technique—talk to each other and trade "secrets" and help us all improve!

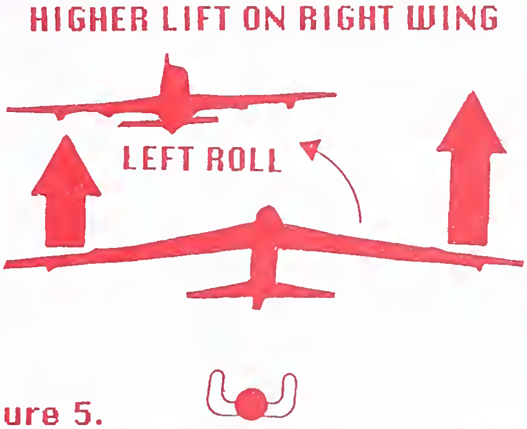


Figure 5.
Right of Centerline - Neutral Yoke

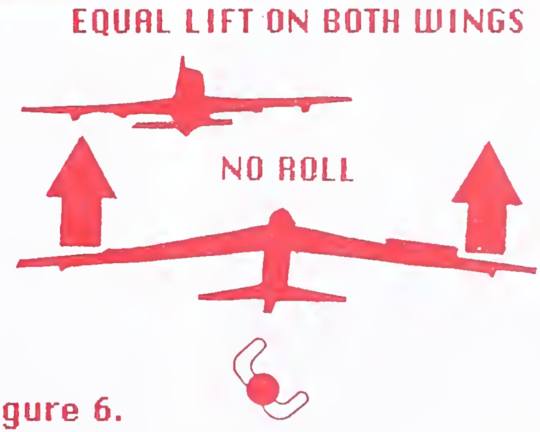


Figure 6.
Right of Centerline - Right Yoke

Project Warrior

# Seventy Years of Excellence

**Capt Jeffrey E. Thieret**
**31 TES, Edwards AFB**

Then Capt Carl "Tooey" Spaatz was the second commander of the 31st Aero Squadron.

Along the far western edge of the barren Mojave Desert, amid the Joshua trees, creosote bushes, rattlesnakes, and scorpions, there lies an elite bastion of test pilots, crew members and engineers at the Air Force Flight Test Center, Edwards AFB. Proudly anchored into the heart of the high desert is the 31st Test and Evaluation Squadron, Strategic Air Command.

The 31st is SAC's representative in the world of flight test. The squadron is tasked with monitoring and participating in the initial operational test and evaluation (IOT&E) conducted for SAC at Edwards. We are SAC's "conscience," as the Honorable Mr. John Krings, Department of Defense Operational Test and Evaluation Center Chief, stated recently at a squadron dining out. We make sure that SAC is getting what SAC wants, and that it does what it was designed to do.

An assignment to the 31st is a special activity MAJCOM assignment, and the squadron reports directly to Headquarters SAC under the Deputy Chief of Staff/Plans. Personnel are selectively screened and requested based upon their individual levels of technical and operational expertise. With over 90 officers and 300 enlisted personnel, we are the largest initial operational test and evaluation squadron in the Air Force. We function in much the same way as a SAC wing, including operations, maintenance, and long range planning, but we also have a large number of engineers as well. The biggest difference is that squadron members are "matrixed" to many different projects. While they administratively belong to the 31st, they are operationally committed to their specific test programs. Squadron members may find themselves working hand-in-hand with Air Force Systems Command (AFSC), the Air Force Operational Test and Evaluation Center (AFOTEC), numerous contractors, and government Civil Service employees.

OK, so why the awesome patch when we are not a combat operation? The history behind the patch is a long and proud one, and one that certainly bears mentioning. The 31 TES took over the IOT&E reins from SAC's 4200th Test and Evaluation Squadron on 1 July 1986. The 4200th was deactivated and the former 31st Bombardment Squadron (H) was reactivated and redesignated by CINCSAC direction. Despite the test mission of the squadron, former CINCSAC and current Air Force Chief of Staff Gen Larry Welch felt that it was critical for the members of each SAC unit to have a rich combat heritage with which it could identify. This heritage would serve as a constant reminder of the ultimate purpose of the Air Force. We are all warriors, whether potential or seasoned, and this theme must underlie everything we set out to do. The men and women of the 31st have been serving their country in varied capacities for 70 years...70 years of excellence.

On 26 June 1917, the 31st Aero Squadron of the Army Signal Corps was organized at Kelly Field, Texas, under the command of 1Lt John E. Rossel. This was to be the genesis of a long and prestigious history.

Capt Carl "Tooey" Spaatz took over the squadron on 13 July 1917. Capt Spaatz, who took the 31st Aero Squadron across the Atlantic and into the bleak environment of World War I, later became General Spaatz, commander of the Allied Air Forces in Europe during World War II and the Air

**A 31st B-7 with ground and combat crews. All seven operational B-7s were assigned to the 31st Bomb Squadron during the 1930s while they were stationed at March and Hamilton Fields in California.**

Force's first Chief of Staff in 1947.

The 31st served in two primary locations during World War I, Issoudun and Field Five, both in France. It was in France that the "skull and crossbones" was first placed upon a 31st Aero Squadron aircraft by an unknown aviator. The emblem stated a simple message to each and every aircraft in the sky. . ."Enemy Beware." The War Department officially approved the patch in 1934. The 31st Squadron motto was later declared to be. . ."Glory on the field of battle; courage before every danger; fidelity to our nation and flag; and honor before all men."

The squadron was reconstituted following the war and was subsequently deactivated and redesignated as a Bombardment Squadron on 24 March 1923. It remained on the inactive list until April Fools day, 1931, when the squadron was activated at March Field, California.

The 31st Bomb Squadron performed duties at both March and Hamilton Fields in California, the most famous of which were the Army Air Corps mail missions flown under the leadership of General "Hap" Arnold. The squadron flew B-7s, B-10s, B-12s, and B-18s throughout the 1930's.

On 1 February 1938, the 31st left for Hickam Field, Hawaii. From its arrival on 8 February 1938 until permanently departing for continued action in the South Pacific theater, squadron personnel served at Hickam, Luke, and Bellows Fields, and Kepap and Kualoa Airdromes. The 31st was now a part of the famous "Bomber Barons" of the 5th Bombardment Group.

The 31st reportedly had all of its B-18s either damaged or destroyed during the 7 December 1941 Japanese attack on Pearl Harbor and Hickam Field. The squadron was soon back in the air, tasked to support maritime bombing and surveillance missions, and flying B-17s until 1943. During that year, the 31st switched to the trusted B-24 Liberator bomber and continued pounding the Japanese into submission in the South Pacific arena. The 5th Bomb Group headquarters was moved to Guadalcanal, and it was there that the 31st joined their companion "Bomber Baron" squadrons to spearhead the Allied drive against the Japanese. Bombing Kahili, Kavieng, Paulau, Biak, Woleai, Truk Atoll, Yap, the Carolines, and Marianas, they advanced the bomber line steadily

Lt Ralph A. Snavely wears one of the earlier versions of the "skull and crossbones."

through the Pacific toward the Japans.

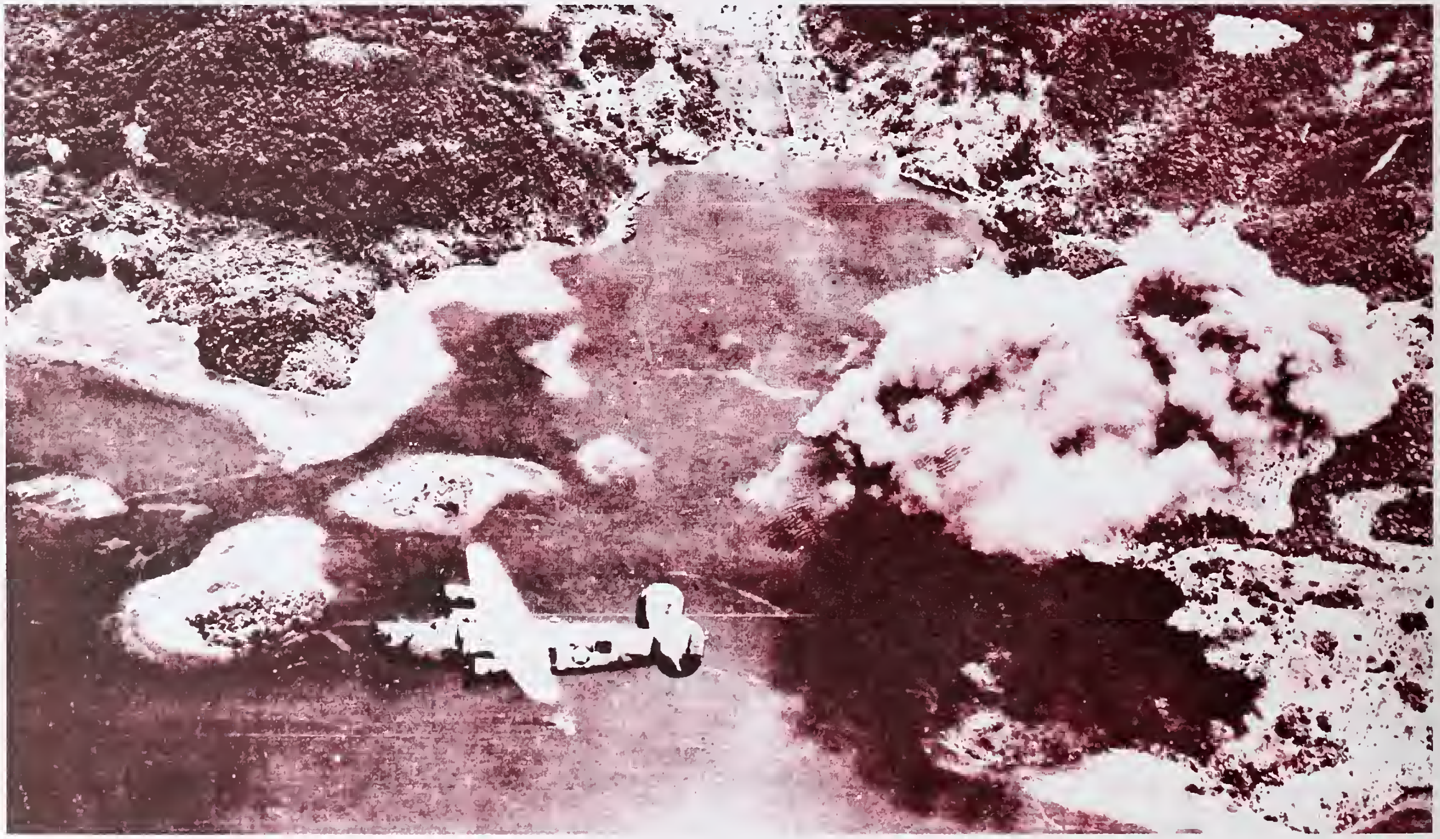
The squadron received two Distinguished Unit Awards for action in the Pacific; the first for the complete devastation of Woleai; the second for the spectacular raids on the Balikpapan Borneo oil refineries for over 16 continuous hours in September 1944. Less spectacular, but equally important, were the raids by the 31st on Japanese factories and installations at Cebu, Kadat, Sandakan, Miri, Jesselton, Datu, Celebes, Halmaheras, Palawans, Jolo Islands, Panay, Zamboanga, Negros, Luzon, Mindano, and Philippines. The 31st was striking enemy bases in Formosa late in the summer of 1945 when news of the war's end was received.

Serving throughout the Pacific after the war, the squadron was redesignated in October 1947, this time as the 31st Reconnaissance Squadron. The squadron flew B-29s and RB-29s and was part of the Far Eastern Air Force. The 31st "Recce" accomplished many of the initial recon raids over Korea when the conflict first began in 1950, receiving the Republic of Korea Presidential Unit Citation and three battle credits for its actions.

In late 1950 the 31st was moved back to the U.S. and placed under the 5th Strategic Recon Wing at Travis AFB, California, where it began flying RB-36s in 1951. It converted completely to the B-36 by 1955 and was redesigated once again as the 31st Bombardment Squadron (H).

The 31st accepted the Strategic Air Command's first B-52G in February 1959 and christened her "The Spirit of Solano County." The squadron then received marching orders for relocation to Beale AFB in early 1960, and remained stationed there until the most recent deactivation in February 1963. The proud lineage of the 31st rested on the inactive list until 1 July 1986, when the Air Force dusted off all of those

A 31st Bomb Squadron B-24 Liberator bomber takes part in the bombing of Biak Island, during World War II, with other 5th Bomb Group "Bomber Baron" squadrons.



A 31st Bomb Squadron B-24 crew piloted by Lt Doyle Kingery (top row, far right). When the 31st was reactivated at Edwards AFB, Lt Kingery attended the ceremonies to pin on the 31st guidon.

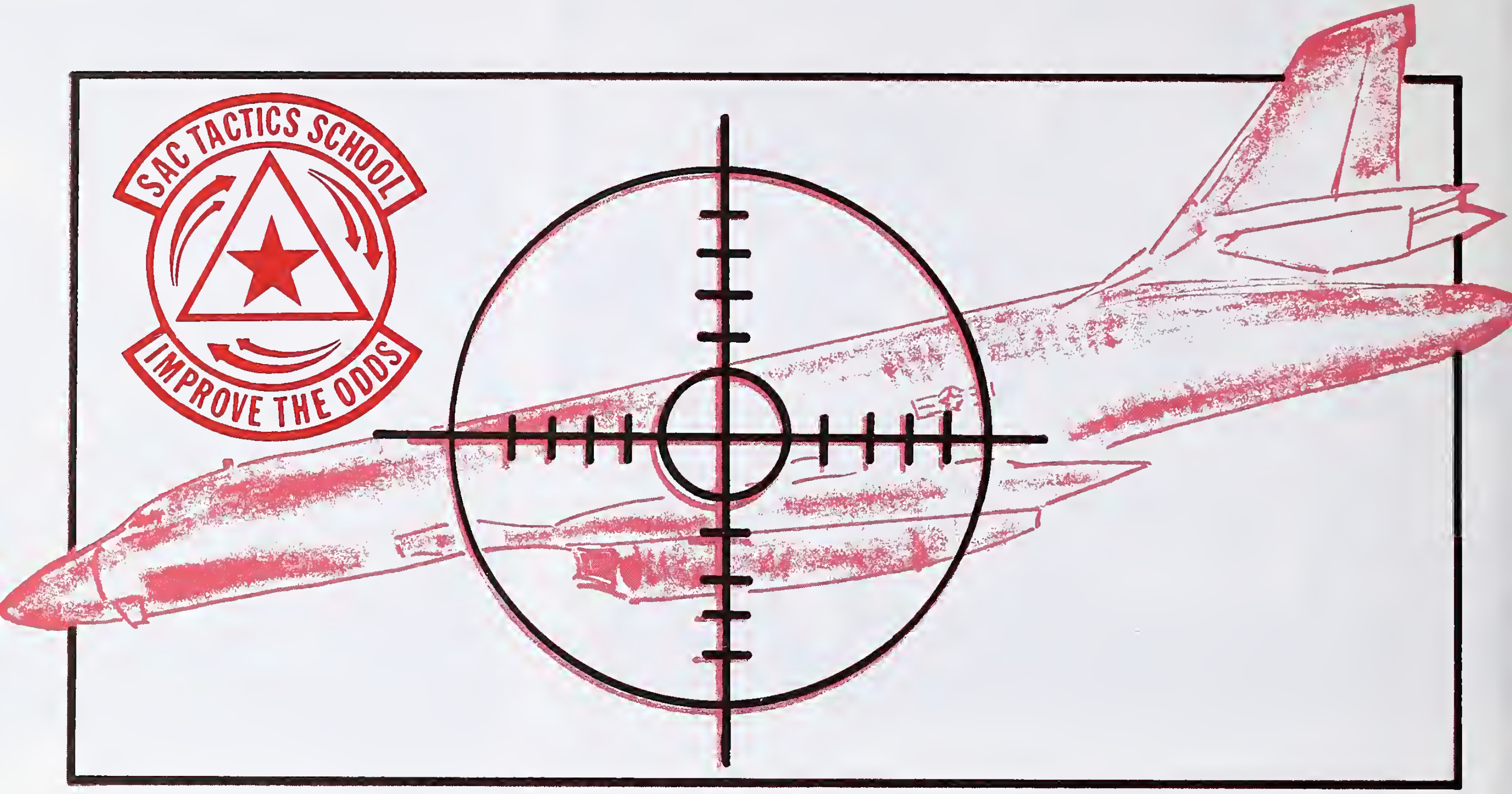
Col Lucion N. Powell, 5th Bomb Wing commander, accepts the Air Force's first B-52G in ceremonies held at Travis AFB in February 1959. The 31st Bomb Squadron was the first to fly the "Spirit."

battle honors and moved the squadron to Edwards.

The rich and decorated history of the 31st serves as a point of reference for all who serve within her today. The mission of the 31st may not presently be a combat mission, yet the work done within the squadron on vital programs such as the B-1B, B-52G/H Strategic Radar and Offensive Avionics System Block II, Advanced Cruise Missile (ACM), Common Strategic Rotary Launcher (CSRL), RB-111 Avionics Modernization Program (AMP), KC-10, and KC-135R (to name but a few) will ensure the strength and readiness of our nation's strategic forces for years to come. The dedicated efforts of the men and women of the 31st stand as a proud testimony to the delicate and complex systems that we strive to complete. The job here at Edwards is by no means an easy one because weapon systems seldom come off the production line ready for combat. The members of the 31st who work on these systems must know the most current tactics and employment strategies. For this reason, most of the flight crew and maintenance personnel have prior operational SAC experience. The 31st's task is to be the final inspection station before a strategic system is utilized. Our mission is an important one, to make absolutely certain that SAC's new weapons systems are operationally suitable and effective.

As the 31 TES squadron patch is seen throughout the command, let it be a solemn reminder of the sacrifices and hardships required to keep our great country free and independent. Those of us who wear the "skull and crossbones" are honored by its heritage. . . the heritage of the 31st Aero, Bomb, and Recon squadrons that lives on within the heart and soul of the 31st Test and Evaluation Squadron.

Ringing through the dry, dusty desert air are the sounds of freedom. . . the roaring thunder of B-1Bs, B-52s, FB-111s, KC-10s and KC-135Rs. And though it is true that peace will always be our profession. . . let the **"ENEMY BEWARE."**



# Tactical Exploitation Concepts

**Maj David C. Loewer**
**Nellis AFB**

Webster defines "tactical" as. . .of or relating to combat tactics: as. . .involving action or means of less magnitude than those of strategy." Exploitation concepts are just what you think; taking undo advantage of something or someone else. What significance does this have for you? The standard preflight briefing has always been that "I'll fly the black line, turn on the circles, refuel in the squares, bomb the triangles" and, of course, "avoid the threat."

This is all great in a grand, strategic sense but is the strategic sense sufficient when you find yourself "beak to beak" with the adversary? Most likely you will need to tactically counter this threat. How can you analyze your adversary and develop options to employ against him prior to combat? You need to not only avoid the adversary but also the ground (Pk = 1). Putting your aircraft into a maneuver that exceeds your or the aircraft's performance envelope will turn your jet into the world's largest dart as well as doing the adversary's job for him. Understanding how to safely avoid or degrade your adversary is crucial to getting the mission done.

One of our taskings at the SAC Tactics School is threat exploitation and tactics development. That is, we compile all available, pertinent data about the adversary's ability and our own ability to perform the mission. Then we attempt to exploit the weaknesses and strengths of the respective system. If this sounds like it could get a little confusing or complex, you're right on target. What makes the analysis even more pressing are the consequences of losing. That brings us to the point of this article, namely, How can you, the crew member, become adept at "tactical exploitation" of your adversary?

As you may have guessed, the first thing you need to do is gather information for analysis and assemble it into some semblance of order. Systems and profiles for analysis are as varied as the number of analysts; each one has his or her own style. A very simple, generic airborne interceptor (AI) format that you might want to use could include: maneuver capability, weapons loadout, radar system used, and the type of training and doctrine he may use. The particular organization can be oriented to each type of threat you wish to analyze. The principles, though, remain the same.

There are many sources for analysis information available to you. Your intelligence shop is the first place to go. You'll find that documents abound in some very dusty safes that the crew member may never have seen. You need to enlist the aid of your intelligence personnel in order to make the best use of the information that you do find. Once you have educated intel about the type of information you are searching for, they may be able to suggest additional sources. Keep in mind the education process works both ways, ops can gain some knowledge of available sources and intel gains an understanding of the type of analysis you need. Lastly, don't forget that you can also obtain some detailed analysis information from the Headquarters.

Once you have located all of the available sources of information, you need to begin assembling it for comparison. The way you order or group your information can suggest a number of avenues for exploitation. When I do a threat analysis, I begin with the maneuver capability of my adversary. The type of things I like to look at are: range, speed, g capability, and maneuvering envelopes. A simple list at first glance, however, you need to add the little things that make the game interesting. For instance, the range may change significantly when you look at refueled vs. unrefueled, dash capability, use of military power vs. afterburners, fuel consumption, external tanks, pods, and/or conformals, just to mention a few. Any of these items could add to or detract from your adversary's capability in a tactical engagement. For example, an AI may not be able to reach you from his normal staging base with a nominal weapon load which may eliminate him as a threat or at least reduce his weapon load. Many of these same elements have an impact on the energy/ maneuverability of the aircraft and how it can be employed. An AI may have a five "g" capability until you take it to altitude and load weapons on it, then he becomes a two "g" aircraft. Don't give your adversary "mystical" powers.

Now let's look at the weapon loadout of my adversary. What type of missile or missiles does he carry? Does he carry guns? How will he employ those weapons and in what mode? What doctrine might he employ and from what aspect and range have his attacks begun historically? Does his weapon loadout have a bearing on how far he can come out for you, and if so, how? You also need to look at the capability of the missiles and guns that he carries. Questions relating to the range and accuracy of those weapons are important to you if you anticipate facing the adversary. An example would be a missile that can reach out over 100 kilometers, a scary number until you realize that the range is contingent upon a rate of closure (Vc) equivalent to 5.0+ Mach. Here again we need to look at the management of the threat envelope.

Obviously, the type of radar system the adversary may use against me is important. Types of questions that you need to address are those relating to detectability and responsiveness. What power/frequency does the system have and can I respond to it in the aircraft that I am flying? Does the altitude or terrain I'm flying over have any bearing on the system's usefulness? How well does the system process information and can I complicate the adversary's effort? You need to look into all of the exploitable characteristics of the system and determine which of those you can exploit.

Finally, the type of training that my adversary has had and the doctrine that he uses is of considerable interest to me in any tactical engagement. Many of the factors governing his employment of weapons are determined by his training. You have already seen how the adversary's doctrine can influence his employment of weapons and even the range of intercept. Remember, one of the most important parts of any system is the man who is operating it.

All of these items and more are of interest to you, the crew member, who is involved in determining the capability of the man you meet in the air. Which items are the most important? There really is no way to tell with any certainty which items are most important due to the nature of your operational environment. At any moment the situation and your awareness of it will determine the applicability of any part of your analysis. Keep in mind that tactics development does not take place solely at the Tactics School, 1CEVG/STT, or the Headquarters, but throughout the command. The concepts and ideas about employment/exploitation must come from those who are most concerned about survival in the combat environment. It still boils down to you, the combat crew member, getting involved and getting smart about your adversary. You are the key players in both developing tactics and in the exploitation of our capbilities to wage war on any scale. The bottom line is that you, the crew member with the jet strapped on, must take the initiative to **"Improve the Odds."**

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**About the Author.** Major Loewer is a 1974 graduate of Ohio State University with a BS in business administration. He received a masters in management from Embry-Riddle Aeronautical University in 1985. Maj Loewer is an instructor radar navigator with experience in B-52D/G and H model aircraft. He is currently assigned to the SAC Tactics School at Nellis AFB.

# All in a Day's Work

**Capt Mark Gillett**
**SSgt Mark Sletten**
**28 BMW, Ellsworth AFB**

After a bus ride at 0530, our crew meets at base operations to check the NOTAMS, review takeoff data and file all appropriate forms in preparation for a scheduled 14.2 hour sortie in Giant Drill 87-1, a Strategic Air Command Emergency War Order communications exercise.

When we arrived at the aircraft at 0615, the crew chiefs and the aircraft forms were not immediately available, so we continued with our preflight. During the walk around inspection, I found that the water used for augmented thrust on takeoff had not been uploaded—an item we definitely needed for our current conditions. After a call to the command post, the crew chiefs arrived with the forms which had not yet been updated. So what, just a normal day of flying, right? Well read on!

Our 0726 takeoff, departure and later the onload during air refueling went as planned. We only had one small problem up to this point. The aircraft, modified with the new Fuel Savings Advisory/Cockpit Avionics System, had a digital fuel panel that wasn't sure of itself. The aft body fuel gauge would vary occasionally up to 10,000 pounds. Six of the remaining eight fuel gauges would also vary from 1,500 to 3,000 pounds. Oh well, at least we knew how

much we had in the forward body! Since we had just received a 100,000 pound onload from the tanker, we were not concerned with running out of fuel—yet. By using an exact, scientific method (we averaged the readings then timed using the fuel flow), we were able to determine how much fuel was in the aft body tank. During the onload, we allowed the main wing tanks to fill by waiting for the fuel level control valve lights on the air refueling receiver panel to come on. Now we knew where everything was—right?

At takeoff plus 11 hours (whew!), the pilot noticed the number three hydraulic overheat light flicker on and off. We got the Dash One out to review the procedures for a hydraulic pump overheat. The light flickered once more, and then stayed on. I immediately depressurized the right hydraulic system and hacked my clock to time the illumination. One and a half minutes later the light extinguished, and we decided to continue the sortie with the right hydraulic system depressurized.

Once released from our orbit area, we proceeded to the IAF to hold and burn enough fuel to attain landing gross weight of 170,000 pounds, which was not easy to determine considering our wildly fluctuating fuel panel. While holding, we called Metro to get a final weather update. They were calling for a 1,000 foot ceiling, moderate rime icing from the final approach fix on down, and an RCR of 15 with ice/snow on the runway. With the assistance of an instructor pilot in the command post we computed our landing ground roll, flare distance, inflight minimum control speeds, and reviewed the possible loss of all hydraulically actuated components of the right system.

While holding, we came up with "plan A:" Declare an emergency, shoot the penetration from the IAF and wait until 15 DME to repressurize the right hydraulic system. At that time we would lower the flaps to 40 degrees (using pressure from our operative number four hydraulic pump).

Everything went fine until 15 DME when I repressurized. I checked the right system pressure and it indicated the hydraulic preload of 2,000 PSI. Checking the hydraulic pump inoperative lights proved my suspicion that both pumps on the right side were not working. I immediately requested clearance back to the IAF with a block from 12,000 to 14,000 feet. After getting established in holding, we researched the problem.

I determined that moving the rudder power switch to cutoff allowed the right system pressure to return to normal with the auxiliary pump. In this configuration, the number four hydraulic pump inoperative light would extinguish. Figuring the pump was now supplying good pressure, I turned off the auxiliary pump. The result was that my right system pressure returned to preload. Time for "plan B."

Again, using the help of the instructor pilot in the command post, we computed and cross checked new landing data. This is the same landing data problem you get to do once a year during your standboard testing. Based on 30 degrees of flaps, inoperative speed brakes, no leading edge flaps, increased threshold speed, and present field conditions, (RCR 15 with ice and snow on the runway), we came up with a landing ground roll of 12,700 feet. NO problem since our runway is 13,497 feet!

The navigator, with the assistance of the boom operator, proceeded to manually lower the flaps to 30 degrees. Once again we departed the IAF to begin the approach. At 15 DME, I repressurized the right hydraulic system and turned on the auxiliary pump to build pressure. I asked the pilot to move the flap lever to 40 degrees. With the flaps tracking slowly to 40 degrees, I requested a 360 degree turn to allow the flaps time to come down to 50 degrees. We rolled onto final and turned the rudder power switch on once the flaps had lowered completely. In this configuration we attained normal high range rudder pressure.

After 14.8 hours of flight time, 16.9 hours into our crew duty day, our wheels finally touched down for an **uneventful** full stop landing!

The lessons learned? We are flying in an airplane that's anywhere from 23 to 32 years old. The C-135 is an extremely reliable aircraft with redundant systems and procedures to handle most situations. As long as we've had the C-135, there's still the possibility of a problem not being covered in the book. In our case the number three pump failed and the number four pump was not strong enough to handle normal loads. Because of possible contamination and loss of hydraulic fluid, I did not want to use the hydraulic crossover valve.

Many of our missions are uneventful which can give us a false sense of security and lead to complacency. I believe the best way to combat this complacency is to demand good crew coordination. Nothing can help you more in an emergency than your crew knowing the systems, their jobs and what each person is going to do. On mission planning day when you get to the block marked "crew coordination" on your briefing guide, talk about it. I like to say "The aircraft commander will fly the aircraft, the pilot will run checklists and coordinate with center, the navigator will talk with command post, and the boom operator will assist by researching the problem."

How you handle the malfunction or emergency is important. Knowing that each crew member is aware of his/her area of responsibility will make it easier.

For us, what began as a partial systems malfunction turned out to be a lot more complicated. Our preparation paid off. Excellent crew coordination enabled us to get the job done smoothly and efficiently. With a little work this can work for your crew as well.

# A Christmas Wish

Maj Michael E. Wells
1Lt Robert S. Hopkins III
24 SRS, Eielson AFB

*Dear Santa*

*I have been exceptionally good this year and have decided to write and ask you to bring me a rewarding, high visibility assignment with a keen sense of adventure. I want this assignment to challenge my flying skills to their limits. I'd like to learn the art of receiver air refueling and fly some 40 hours per month. My new unit should have high morale and great esprit de corps.*

*In short, I'm looking for the ultimate flying assignment.*

*Sincerely,*

*A Tanker Driver*

*Dear Tanker Driver*

*I checked and rechecked my list of primo assignments and found quite a few good ones, but none which exactly fulfilled all of your desires. I thought Christmas would be a disaster for you until I got close to home. There, close to North Pole, I found your ideal assignment.*

*Your new unit accepts only the best. In fact, as a primary flight crew member you must have plenty of previous flying experience. You'll need it to operate from an air base with perhaps the harshest and most unpredictable conditions in the world.*

*Your assignment will open new career doors for you, and when it's time to move on, your flying experience will put you well ahead of your peers. I know you'll like it.*

*Sincerely,*

*Santa*

**The RC-135 COBRA BALL takes off from Shemya AFB.**

Leaping from bed at the sound of the klaxon, a quick glance at the Seiko confirms what your body is already telling you; 0315L! The sounds of pounding feet in the hall are accompanied by the howling of wind and the roar of AGE equipment springing to life. Five minutes later you're strapped in and monitoring your engines as they come up to speed and simultaneously listening to the latest weather coming in over the radio. "Sky partially obscured, 300 overcast, visibility one mile in snow showers and blowing snow, winds 350 at 10 gust to 24, altimeter 29.94. Minutes later, gusting winds buffet the aircraft as power is advanced for takeoff. As the remaining runway dwindles, the nose of the heavyweight bird is lifted into the air and with a sense of satisfaction you note the time: 0330L. Fifteen minutes to gear in the well. "Not the best" you say to yourself "but darn good for an oh-dark-thirty gronk."

If you think handling an emergency is tough, throw in some operational mission considerations over remote areas and you'll have some sense of the challenge required to complete the mission.

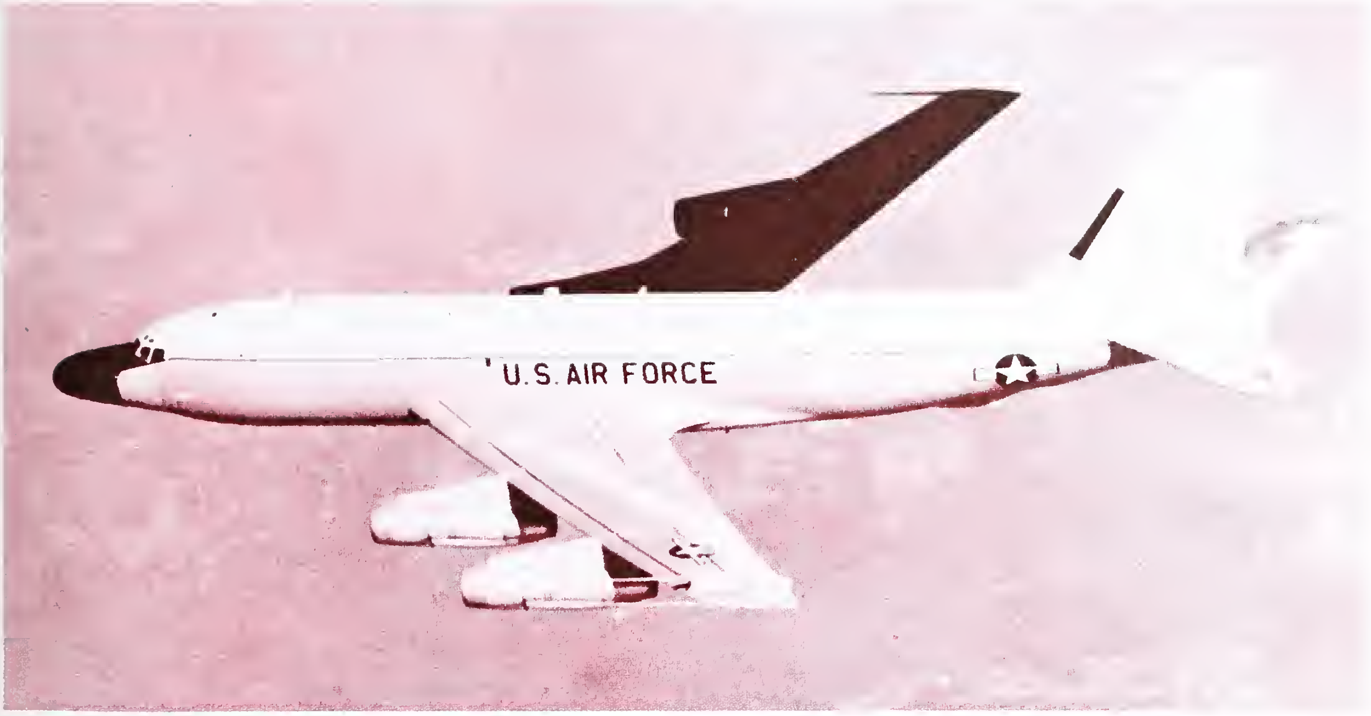
Later, to conclude a successful mission, the weather gods have concocted an equally noxious brew to penetrate on approach and landing. The microwave landing system seems the best bet for today, and the SOF has reported that snow removal equipment has been removed and you're cleared in. Dumping extra fuel that you had saved for a possible divert begins on a 15 mile final in order to reduce to max landing weight prior to touchdown. A final safety check confirms everything is set and you mentally review the steps for that perfect crosswind landing. Not a good day to get sent around by the SOF so let's get it right the first time. On rollout your feeling of fatigue is overcome by the sense of pride at being associated with such a smoothly run team effort.

A description of an Air Defense reaction to an inbound Bear. . . perhaps a zulu alert mission along the FRG? No, this is ops normal for SAC's only mission to regularly launch off alert, the RC-135's of Eielson's 24th Strategic Reconnaissance Squadron. Missions such as this are never routine, and can only be conducted by consummate professionals who know how to work as a team.

Because of its location and the inherent lack of publicity associated with the strategic reconnaissance business, top-notch flyers looking for a great assignment may overlook a career-broadening tour in the RC-135.

The mission of the 24th is both exciting and unique. The unit flies the RC-135S COBRA BALL and the RC-135X COBRA EYE platforms, which fly strategic reconnaissance missions.

The unit also flies the sole TC-135S, a flight-crew proficiency trainer used to enhance skills in air refueling, special navigation procedures, precise instrument flying and landings.



The 24 SRS flies the RC-135X COBRA EYE platform.

Although based at Eielson, the aircraft are often deployed to forward operating locations, most notably Shemya AFB. Shemya is located near the tip of the Aleutian Islands, some 1400 miles from Eielson.

Flight and mission crews are TDY to Shemya for one or two week tours. While there, they fly no-notice operational missions which may average eight to ten hours and are usually inflight refueled. Following a commensurate period of crew rest, crews are again ready to launch on yet another mission. Each individual may normally expect to log 50-60 hours during a single TDY.

Operating from Shemya demands uncompromising procedural knowledge and the finest flying and navigational skills.

Pilots must routinely take off heavyweight (285,000 pounds is average), onload fuel to near maximums in any one of several aerial refuelings, and then recover to a 10,000′ runway (no overruns) following an approach to minimums with a 25 knot crosswind. Reduced RCR's are the rule rather than the exception.

Navigators are responsible for the precise positioning of the aircraft to ensure that it remains exactly on track, and to provide the optimum placement and timing of the aircraft for mission requirements.

Aircraft commanders must be –135 instructor pilots with at least 2500 hours of flying time. Previous experience with receiver air refueling is not required.

All pilots in the 24th have at least 18 months prior experience in KC, EC, or RC-135s; none are assigned to the 24th directly from undergraduate pilot training. Following a tour at Eielson, most stay with the RC-135 as aircraft commanders at Offutt AFB.

Landing at Shemya requires the finest flying and navigational skills.

There are two navigators on each crew. Like the pilots, they also have considerable experience prior to their assignment to the 24th, and many new arrivals are instructor navs. Upgrade from Nav2 to Nav1 occurs relatively soon given the considerable flying hours.

Regardless of position, you'll need a strong flying background and excellent officer qualities. You must also be eligible for an elevated security clearance.

The 24th is a small unit and the unique demands of its operation make for a close-knit organization which fosters professional and fraternal bonds which span careers and lifetimes.

If you're looking for the ultimate challenge in a flying career, the 24th is **THE** place to find it.

# Technical Orders—Your Road Maps for Safety

Capt Joseph E. Mecadon
4315 CCTS, Vandenberg AFB

Santa Barbara lies on a magnetic heading of 100 degrees from my residence at Vandenberg AFB, at a straight line distance of 37 miles. I know my car will go 120 mph. I realize there is a 55 mph speed limit, but I'm sure that only applies on roads. Since I'm going to go in a straight line, I won't be on roads much. To be on the conservative side, I'll plan my trip at an average speed of 80 mph—33% under maximum should provide an adequate margin for safety. I need to get to Santa Barbara tomorrow. . . , so, using the above information, it looks like I ought to give

myself about 28 minutes. Sound good?

Sounds crazy! If I had absolutely no concern for my car, less for my continued good health, and were the coastal mountain range not between us—I might survive to tell the tale. What I'm trying to get across is the fact that anytime you run a procedure without reference to the appropriate technical order (TO), you are running the same risks. Okay, not exactly the same. In your case, the property at risk is no doubt worth far more than my car, and the number of lives in jeopardy will often be greater than one. Your chances of arriving at your destination intact and on time may be better, may be worse. Feeling lucky?

For a few minutes, I'd like you to think of a TO checklist as a "roadmap" of a particular area. Your TO then becomes an atlas, a tour book to anywhere in the weapon system you may want to visit. Let's talk about these maps.

Like any map, a checklist is designed to show reasonable routes that allow us to get from where we are to where we want to be. The key word here is "reasonable." We can be fairly certain no map would require us to ford a river without a bridge, or drive off a sheer cliff to save a few minutes drive on a road. Similarly, checklists are written to ensure we take no action that might inadvertently endanger us or cause damage to the equipment entrusted to our care. Roads are clearly marked for the safety of drivers . . . NO PASSING, DANGEROUS CURVE, REDUCED SPEED AHEAD. On a checklist, WARNINGS, CAUTIONS, NOTES, and AMPLIFICATIONS perform this service. Be alert when you read these, they open our eyes to various aspects of the procedure we may not have considered. As with roads, checklists provide routing information in the form of LEAD-INS: "If . . . ," "Otherwise . . ." Turn left, turn right, go straight. Don't zip by these, you may find yourself headed south in the north-bound lane.

I am convinced my initial route to Santa Barbara was a bit absurd. Clearly, although it is farther and takes a bit longer, it's to my benefit to use the highway. It is the only way to get there from here in a safe and prudent manner. Just as clearly, checklists are the tested and approved routes for any foray into the weapon system. Remember, an appropriate straight line is NOT always the most direct route through a situation. How many times have you proclaimed a step "not applicable," only to find in the ensuing confusion, that it did indeed apply? In our early days—before we were "smart" enough to get by without the TO—how often did we, completely clueless, put our faith in the checklists, follow it blindly—but religiously—and hammer out the solution. I did . . . , and it never once steered me wrong. There are pitfalls out there we may not be aware of. Strict adherence to our procedures will preclude something jumping out of one of those pitfalls and sinking its teeth into the thickest part of our anatomy.

**"Like any map, a checklist is designed to show reasonable routes that allow us to get from where we are to where we want to be."**

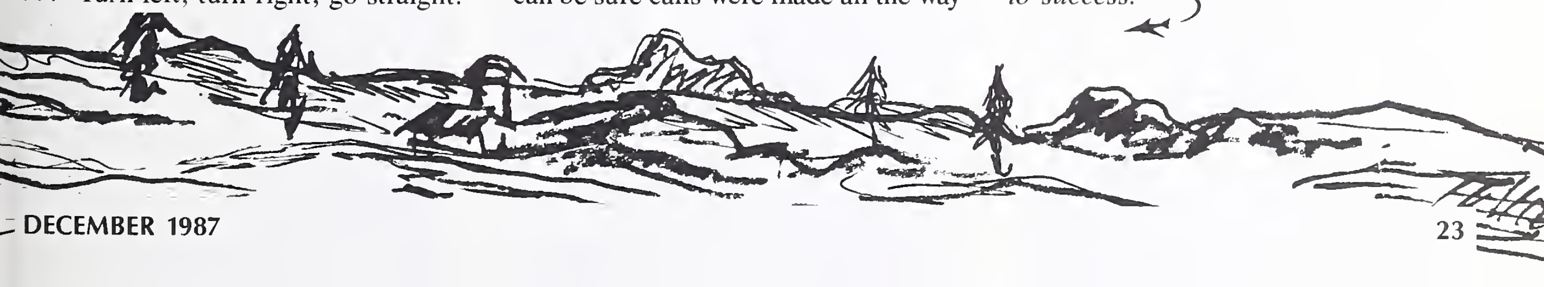
But, what about the times we get into strange situations not covered in the TO? A B-1B incident provides some insight into a "problem" area. Due to equipment failure, the aircraft was forced to land with its wings swept almost fully aft. A new weapon system, and a problem that had never occurred; this was truly a unique situation. We can be sure calls were made all the way up to the contractor. Ultimately, all information necessary for the safe recovery of the aircraft and crew was retrieved from the -1 TO. Ask the "old heads" how many times they have been forced to ad lib a procedure? Twice? Once? Less?

We all use the TO to accomplish emergency procedures, but how about "routine" day to day stuff? Read the step, get a response. Not doing so might result in a whole lot more than an embarrassed "oops."

Checklist discipline is no more than keeping your crew "between the lines." Pure speed is certainly not something to shoot for. Want to turn your Ford crew into a Ferrari? Every alert, dive into one checklist. Take it apart and see what makes it work. Be aware of every twist and turn, and the reason it's written that way. Pretty soon, you'll be tearing up trainer rides and operating the weapon system without any strain whatsoever.

Of course, TOs are not perfect. You may find "alternate routes" that will accomplish a procedure quicker with less fuss. Before you rush it to print, ask yourself the following questions: How does your proposed change affect the procedure over the entire spectrum of its application? Most importantly, could your proposed change lead to problems in any foreseeable scenarios? If everything looks good, write up an AFTO 22. If your way is better, don't consider that AFTO 22 optional, consider it a professional responsibility —share it with the rest of us.

TOs are remarkable documents. They will lead you, unscathed, through 99.9% of the situations you hope will never arise. So with thanks to Rod Serling, the next time you find yourself "somewhere in that region that lays between the pit of man's fears and the summit of his knowledge," reach for the TO. *Let it be your guide—your roadmap to success.*



# PROFESSIONAL PERFORMERS

## Missile Crew

The 90 SMW Peacekeeper Crew R-154, Capt Joachim A. A. Rogl, MCCC, and 2Lt James N. Blair, DMCCC, is the SAC Missile Crew of the Month. Crew R-154 demonstrated superior weapon system knowledge and professionalism during a difficult alert tour. Due to a multitude of maintenance, security, and weapon system problems the crew remained awake for over 24 consecutive hours.

While performing emergency power and air procedure checklists, the crew received indications of weapon system controller (WSC) malfunctions and of other serious problems developing in their flight area. The crew performed LCC faults for WSC problems in an effort to stabilize LCC WSC and LF interface. At the same time, they were advised that a civilian vehicle was observed passing through the flight area throwing firebombs out of the windows and starting numerous brush fires. The crew again was quick to respond. They performed the missile crew contingency checklist and requested fire, law enforcement and medical assistance. The medical assistance was necessary due to smoke inhalation and cuts suffered by one of the alarm response team members while attempting to extinguish one of the fires. As these activities were occurring, a periodic maintenance team (PMT) was checking out the power transfer capability. The PMT attempted to transfer the LCC back to commercial power, but the minuteman power processor (MPP) malfunctioned making it impossible to provide primary power to the LCC. The LCC was forced to remain on batteries and on emergency air conditioning unit (EACU). Again, the crew was faced with a difficult situation. Failure of either the EACU or batteries would require LCC shutdown. The loss of primary power severely restricted communication with the maintenance teams operating within their flight areas. Using a complex network of relay and patching procedures with the LCCs in their squadron, they were able to maintain contact with all the affected maintenance teams, the support base, and topside personnel. They remained in this mode for approximately 14 hours. Their strict checklist discipline and thorough knowledge of correct procedures helped ensure this sortie was postured to alert quickly and efficiently.

## Munitions Maintenance

TSgt Guy P. Sykes, 5 BMW, is SAC's Munitions Maintenance Airman of the Month. Currently the NCOIC of the missile munitions maintenance section, Sgt Sykes' management has directly contributed to the squadron maintaining its mission commitment. The list of accomplishments includes a 99.99 percent success rate for putting launches on aircraft. Sgt Sykes' dedication to duty was evident when a severe commandwide problem with faulty CF2037 cables appeared. Sgt Sykes worked in conjunction with the director of special weapons to set a quota level for the cables to support the LLC cycle based on the projected fail rate of the cables. As a result, the squadron did not fail an LLC exchange and never missed an alert line. His leadership and management ability are also demonstrated with the section being four months ahead of schedule in maintenance — a truly impressive feat considering the shop is only 70 percent manned.

## ICBM Maintenance

SSgt Joan O. Rose, NCOIC, Facility Maintenance Team Instructor Section, Maintenance Training Division, 44 Strategic Missile Wing, Ellsworth AFB, South Dakota, is SAC's ICBM Maintenance Airman of the Month. Sgt Rose has implemented a program for new students and Team Training Branch instructors that consolidates training and increases the output of qualified technicians from her section by 100 percent. Organizing a combined effort where periodic and facility maintenance technicians worked together on special teams, Sgt Rose and the teams reduced the number of priority 3 site discrepancies by 68 percent in only 90 days. She spearheaded the technical order verification for T.O. 21M-LGM30F-2-7-12 and submitted 37 AFTO forms 22 to correct deficiencies. Sgt Rose undertook the rewrite of 288 FMT lesson plans. She has also maintained a perfect 100 instructor proficiency pass rate. She started a new administrative tracking method for the recurring training program by improving scheduling, task deviation, and documentation procedures. Sgt Rose is also a trainer maintainer, fuels custodian, and precision measurement equipment monitor.

## Aircraft Maintenance

TSgt Elbridge K. Wilson, 9 SRW, Beale AFB, is SAC's Maintenance Airman of the Month. An outstanding performer and exceptionally motivated manager and technician, Sgt Wilson worked intensively with San

Antonio Air Logistics Center (SA-ALC) to arrange and devise a schedule to completely repaint Beale's T-38 fleet at depot. When funds were not available from HQ AFLC, SA-ALC, HQ SAC or wing sources, he developed and initiated a program to complete the task using base facilities and manpower. His efforts saved over $39,000 per aircraft, a total savings of more than $510,000 to date. Sgt Wilson was also a key player in implementing project "Glossy Eagle," SAC's program for refurbishing KC-135 aircraft. The corrosion control work package he developed for the 9 SRW's "Neat Fleet" program was used as a bench mark for the proposed SACR 900-XX that will provide direct guidance for accomplishing this program. Sgt Wilson's professionalism and dedication to duty enabled his shop, squadron, and wing to continually perform complex reconnaissance mission requirements with a sustained high degree of success.

# Flying Crew

Crew E-30, Capt Edward E. Neves, AC, and Capt Charles G. Sherlin, RN, 509 BMW, Pease AFB, is Combat Crew's Flying Crew of the Month.

Capt Neves and Capt Sherlin were flying a high altitude, supersonic sortie in preparation for an aircraft/weapon vibration test. At 36,000 feet and Mach 1.4, the attitude caution light illuminated indicating an out of tolerance comparison between main and standby attitude. A quick crosscheck showed the standby attitude indicator to be unreliable. Approximately five seconds later a loud bang was heard as the right engine compressor stalled. The aircraft yawed to the right and began to lose altitude rapidly. Capt Neves immediately applied corrective control inputs and declared an emergency as Capt Sherlin ran the engine stall checklist. Initial crew actions to clear the stall were unsuccessful, so the decision was made to shut down the stalled engine and attempt an airstart. Capt Neves brought the aircraft around to a vector for Pease AFB as Capt Sherlin directed airstart procedures. As Capt Neves rolled the aircraft out of the turn, the remaining attitude indicator failed at 30 degrees left bank and 15 degrees pitch down, leaving the crew with no attitude reference. While Capt Neves skillfully performed a needle-ball-airspeed recovery in IMC, Capt Sherlin confirmed successful airstart on the right engine. Capt Neves continued the descent to visual conditions and proceeded to the base with no-gyro vectors due to the low visibility conditions. Capt Neves flew a flawless no-gyro GCA to a successful landing. Capt Neves' quick reactions and flawless airmanship, along with Capt Sherlin's indepth knowledge of emergency procedures prevented the possible loss of a valuable Air Force aircraft and crew.

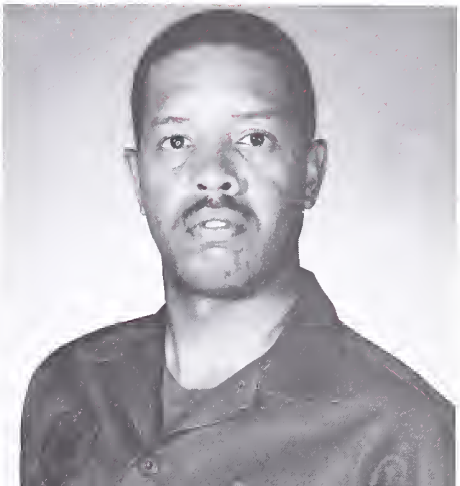
MISSILE CREW

FLYING CREW

MUNITIONS MAINTENANCE

ICBM MAINTENANCE

AIRCRAFT MAINTENANCE



# SAC SAFETY SCREEN

The SAC Safety Screen is an honor roll of SAC's most professional crews. To gain listing on the Screen, crew members must be nominated by their unit commanders and meet high selection criteria of experience in their aircraft or missile system *IAW AFR 127-2/SS1.*

**17 RW, RAF Alconbury Crew E-27:** Maj Todd Hubbard

**17 RW, RAF Alconbury Crew E-35:** Maj Bob Heath

**70 AREFS, Grissom Crew R-181:** AC Capt Bennett Kohler, P Capt Ronald Beltz, P 1Lt Daniel Vick, N Capt John Love, BO Amn Timothy Love

**305 AREFS, Grissom Crew R-123:** AC Capt Michael McClure, P Capt Daniel Smith, N 2Lt John Cibelli, BO SrA Gary Rigby

**11 AREFS, Altus Crew R-133:** AC Capt Mark Eppler, P 1Lt Vic Herrera, N 1Lt Ralph Thompson, IBO Sgt Doug Garrett

**97 AREFS, Blytheville Crew R-108:** AC Capt Michael Connolly, P 1Lt Chuck McQueen, N Capt Lou Kaelin, BO MSgt Carl L Beaird

**97 AREFS, Blytheville Crew R-109:** AC Capt Dave Cantor, P Capt Tim Rose, N 1Lt Greg Maynard, BO Sgt J R Gibbs

**320 BMW, Mather Crew S-01:** AC Maj Edward A Rice, P Capt Scott K Campbell, R Capt David E Snodgrass, N 1Lt Kelvin C Bowen, E Capt Mark J Hess, G TSgt Noah L Elliott

**320 BMW, Mather Crew E-23:** AC Lt Col Norwood A Hart, P 1Lt Paul G Bell, R 1Lt Frank J Kehl, N 2Lt Theodore T Deguzman, E 1Lt Robert F Voelker, G Sgt Mark A Montanez

**340 BMS, Blytheville Crew R-12:** IP Maj Don M Needham, AC Capt William M Reed, P 1Lt Kevin L Kent, RN Capt Rodger A Soard, NN 2Lt James G Vick, EW Capt Keith B Bartsch, G A1C William J Kerwood

**340 BMS, Blytheville Crew E-41:** AC Maj Rick L Mowrer, P 1Lt Robert R Lecorchick, RN Capt John W Chittum, NN 1Lt Mark A Silver, EW 1Lt Bruce H Postel, G A1C Steven A Victor

**344 AREFS, Seymour Johnson Crew E-112:** AC Capt Rory B Russell, P Capt Randle W Suttkus, FE SSgt Robert G Kimery, BO TSgt Richard G Newman

**344 AREFS, Seymour Johnson Crew E-130:** AC Capt Susan Y Desjardins, P Capt Steven F Dempsey, FE TSgt Lester G Bouler, BO SSgt William E Wright

**393 BMS, Pease Crew S-03:** EP Maj Doug Spears, EN Maj Rich Roop

**393 BMS, Pease Crew E-19:** IP Capt Pat O'Connor, IN Capt Brian Young

**393 BMS, Pease Crew S-23:** IP Capt Dave Gibbs, IN Capt Jim Thompson

**715 BMS, Pease Crew R-38:** P Capt Fred Reinheardt, RN Capt Steve Sommers

**715 BMS, Pease Crew R-40:** P Capt Jim Ciazbattoni, RN Capt Terry Sykes

**715 BMS, Pease Crew R-42:** P Capt George Kramlinger, RN Capt John Kirk

**905 AREFS, Grand Forks Crew E-112:** AC Capt Steven D Grogan, P 1Lt Don E Greenberg, IN Capt Eugene A Rohl, BO Sgt James S Wood

**911 AREFS, Seymour Johnson Crew E-012:** AC Capt Edward J Hadzick, P Capt Jeridan Strong Jr, FE TSgt Nelson E Mindoro, BO TSgt Charles W Sanchez

**911 AREFS, Seymour Johnson Crew E-031:** AC Capt James E Heberer Jr, P Capt Wayne M Cottrell, FE TSgt Thomas Stirnitzke, BO TSgt Kelly D Hankins

**909 AREFS, Kadena Crew F-110:** TP Capt Blain Bachus, P 1Lt Ronnie Van Dyke, P 1Lt Todd A Burleigh, TN Capt Eric L Blackmon, TR SrA Paul K Nutter

**909 AREFS, Kadena Crew S-140:** TP Maj John H Cook III, P Capt Patrick W Denton, P 1Lt Michael L Gross, TN Capt Diana B Miller, TR SSgt Victor Arzuaga

**55 SRW, Offutt Crew:** IP Maj Jessie Johnson, IP Maj Steve Jubinski, IN Maj Russ Braudis, FE SMSgt Dave Polke, FS TSgt John McPhatter

**906 AREFS, Minot Crew R-173:** AC Capt Richard Baldwin, XP Lt Tony Martin, YP Lt Ken Ulrich, N Lt Gene Marquez, BO Sgt Mark Ackerman

**23 BMS, Minot Crew E-33:** AC Maj John Graham, P 1Lt Cary Windler, RN Capt Gregg Gustafson, N 1Lt Bernard Lemay, EWO Capt Edward Jaeger, G SSgt Alan Hotaling

**44 SMW, Ellsworth Crew R-023:** MCCC Capt Stephan B Lockwood, DMCCC 2Lt Glenn P Fetter

**91 SMW, Minot Crew R-064:** MCCC 1Lt John R Weaver, DMCCC 2Lt Keith A Brink

**91 SMW, Minot Crew E-083:** MCCC 1Lt John Cherry, DMCCC 2Lt Tyrone Smith

**321 SMW, Grand Forks Crew E-031:** MCCC Capt Arthur F Hebbeler, DMCCC 2Lt Douglas W Humerick

**321 SMW, Grand Forks Crew E-093:** MCCC Capt George W Lau, DMCCC 2Lt Edward S McRoy

**351 SMW, Whiteman Crew R-021:** MCCC 1Lt Alan W Burke, DMCCC 1Lt Michael C Smith

**351 SMW, Whiteman Crew R-053:** MCCC 1Lt Robert R J Provost, DMCCC 2Lt Kenneth D Heiland

You have the right to drink.
You have the right to drive.

You have the right to remain silent.

Don't drink and drive.
Don't ride with anyone who does.

A message from the Reader's Digest Foundation

UNIVERSITY OF FLORIDA
3 1262 09683 6878

Seasons
Greetings

from
the
Staff